

Finding equations of tangents

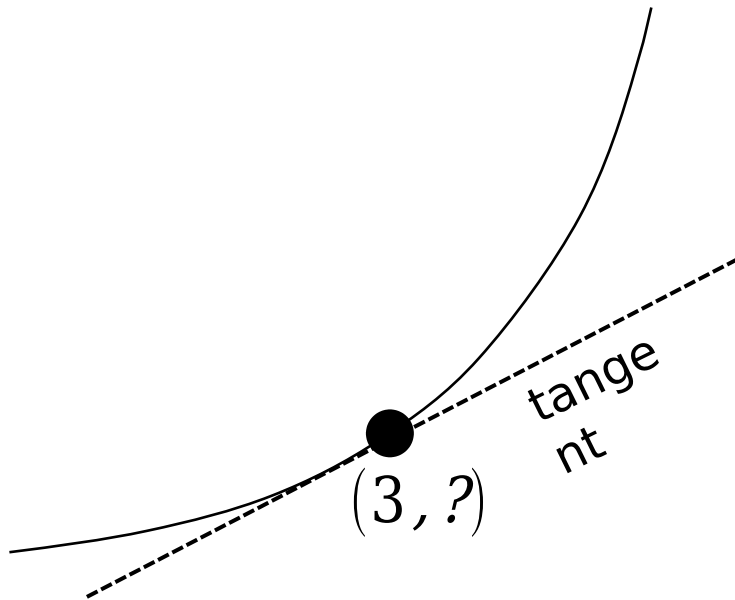
Find the equation of the **tangent** to the curve when .

We want to use for the tangent (as it is a straight line!).

Therefore we need:

(a) A point

(b) The gradient .



Gradient function:

?

Gradient when :

?

-value when :

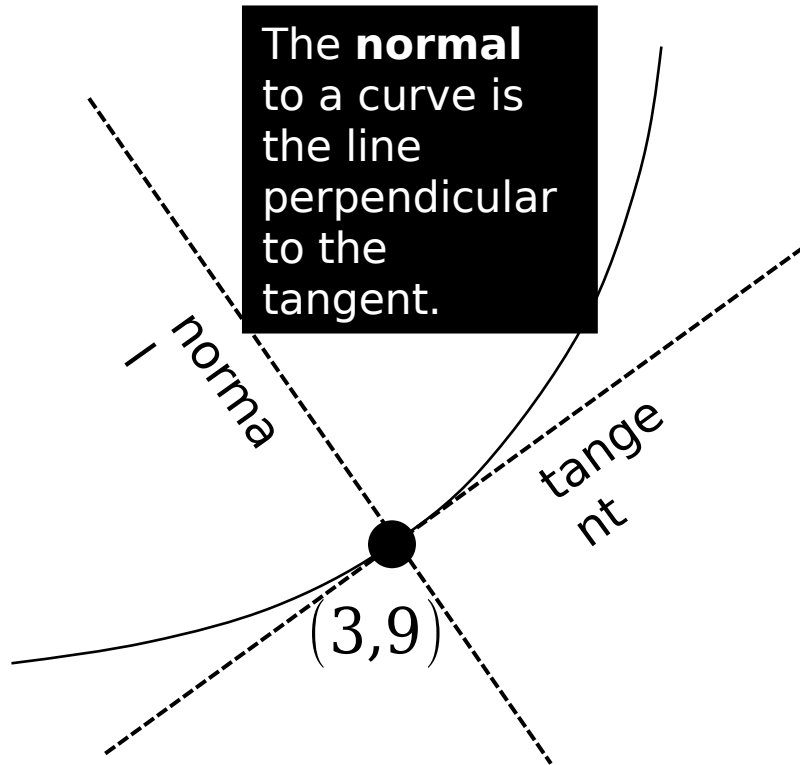
?

So equation of tangent:

?

Finding equations of normals

Find the equation of the **normal** to the curve when .



Equation of tangent (from earlier):

Therefore equation of normal:

?

Fro Exam Tip: A **very common error** is for students to accidentally forget whether the question is asking for the tangent or for the normal.

Test Your Understanding

Find the equation of the **normal** to the curve when .

When ,

? y

? gradient

Fro Tip: I like to use and to make clear to the examiner (and myself) what gradient I've found.

? Final equation

**Exercise 12F**

- 1 Find the equation of the tangent to the curve:
 - a $y = x^2 - 7x + 10$ at the point $(2, 0)$
 - b $y = x + \frac{1}{x}$ at the point $(2, 2\frac{1}{2})$
 - c $y = 4\sqrt{x}$ at the point $(9, 12)$
 - d $y = \frac{2x-1}{x}$ at the point $(1, 1)$
 - e $y = 2x^3 + 6x + 10$ at the point $(-1, 2)$
 - f $y = x^2 - \frac{7}{x^2}$ at the point $(1, -6)$
- 2 Find the equation of the normal to the curve:
 - a $y = x^2 - 5x$ at the point $(6, 6)$
 - b $y = x^2 - \frac{8}{\sqrt{x}}$ at the point $(4, 12)$
- (P) 3 Find the coordinates of the point where the tangent to the curve $y = x^2 + 1$ at the point $(2, 5)$ meets the normal to the same curve at the point $(1, 2)$.

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Chapter 12

- (P) 4 Find the equations of the normals to the curve $y = x + x^3$ at the points $(0, 0)$ and $(1, 2)$, and find the coordinates of the point where these normals meet.
- (P) 5 For $f(x) = 12 - 4x + 2x^2$, find the equations of the tangent and the normal at the point where $x = -1$ on the curve with equation $y = f(x)$.
- (E/P) 6 The point P with x -coordinate $\frac{1}{2}$ lies on the curve with equation $y = 2x^2$.
The normal to the curve at P intersects the curve at points P and Q .
Find the coordinates of Q . **(6 marks)**

Problem-solving

Draw a sketch showing the curve, the point P and the normal. This will help you check that your answer makes sense.

the curve using GeoGebra.

Solutions

[alevelsb_p1_ex12e.pdf \(physicsandmathstutor.com\)](#)